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of

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ANCHORING ATTACHMENT APPARATUS

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ANCHORING ATTACHMENT APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to safety restraint devices and, more specifically, to attachments for securing safety restraint devices.

Technical Background

Seat belt harnesses are known to increase the safety of occupants in various motorized vehicles. Seat belt use is often cited as being the most useful line of defense in reducing accident injury. The recognition of seat belts has been reflected in safety programs advocating their use and state legislation mandating their use. Seat belts vary in their configuration but one of the most common seat belts is the lap belt harness. The lap belt includes right and left belts which traverse an occupant's lap and are secured to each other proximate to the occupant's mid abdomen. Securement of the lap belts is achieved through the use of a buckle which enables fastening to secure an occupant. Such lap belts may be found in almost all seats in automobiles and planes throughout the world.

Although conventional lap belt apparatuses are well used and accepted they do not limit movement of an occupant's head and torso. Thus, although the lower body is restrained, the upper body will experience rapid and dangerous movement during an

1 accident. This is particularly dangerous for passengers in the front seat of an automobile
2 who may strike the dashboard or windshield during an accident.

3 An improvement therefore is to introduce shoulder straps and harnesses to limit
4 upper body movement. Single shoulder straps which traverse diagonally across an
5 occupant's body are used in automobiles and aircraft throughout the world. To a lesser
6 extent, double shoulder straps which traverse vertically across an occupant's upper body
7 are also widely used in vehicles. Double shoulder straps provide additional contact with
8 the upper torso to further limit upper body movement and provide additional safety. Seat
9 belt apparatuses which incorporate double shoulder straps and lap belts are commonly
10 referred to as four point seat belt systems.

11 Another well known and accepted safety restraint device is the inflatable airbag.
12 Inflatable airbags have become very popular in their use in motor vehicles and have been
13 attributed with preventing numerous deaths in accidents. Some statistics estimate that
14 frontal airbags reduce the fatalities in head-on collisions by 25% among drivers using seat
15 belts and by more than 30% among unbelted drivers. Statistics further suggest that with a
16 combination of seat belt and airbag, serious chest injuries in frontal collisions can be
17 reduced by 65% and serious head injuries by up to 75%. Airbag use presents clear
18 benefits and vehicle owners are frequently willing to pay the added expense for airbags.

19 A modern airbag apparatus may include an electronic control unit (ECU) and one
20 airbag module or two. The ECU is usually installed in the middle of an automobile,
21 between the passenger and engine compartment. If the vehicle has a driver bag only, the

1 ECU may be mounted in the steering wheel. The ECU includes a sensor which
2 continuously monitors the acceleration and deceleration of the vehicle and sends this
3 information to a processor which processes an algorithm to determine if the vehicle is in
4 an accident situation .

5 When the processor determines that there is an accident situation, the ECU
6 transmits an electrical current to an initiator in the airbag module. The initiator triggers
7 operation of the inflator or gas generator which, in some embodiments, uses a
8 combination of compressed gas and solid fuel. The inflator inflates a textile airbag to
9 impact a passenger and prevent injury to the passenger. In some airbag apparatuses, the
10 airbag may be fully inflated within 50 thousands of a second and deflated within two
11 tenths of a second.

12 A common feature of seat belt and air bag systems is that both require secure
13 anchoring of their respective members. A seat belt must obviously be anchored in order
14 to restrain a passenger. An airbag must be anchored in one or more places so that it is
15 restrained during its deployment. Airbag anchoring further serves to direct the position of
16 the inflated airbag to an optimal position. For example, side mount airbags and knee
17 airbags must be directed to certain positions to impact intended locations of an occupant's
18 body.

19 For anchoring, a flexible connecting member, such as a tether, may be attached at
20 one end to a member of the seat belt or air bag system. The connecting member is then
21 secured at an opposing end to a fixed member such as a bolt secured to the vehicle.

1 Although the point of inflation of an airbag is firmly anchored, additional tether anchors
2 may further be used to provide additional restraint. For example, the bottom edges of an
3 airbag may be anchored by tethers to pull tight across a bottom panel of the airbag during
4 inflation. The side panels of an airbag may also be anchored by tethers to tightly restrain
5 the side panels during inflation and direct the inflated position of the airbag.

6 One method for anchoring the connecting member is to thread the connecting
7 member through an opening in a plastic or metal anchor plate. The end of the connecting
8 member is then sewn to the connector member to secure the anchor plate. The anchor
9 plate is attached to the sheet metal of a vehicle by a screw or bolt. An anti-rattle member,
10 such as a plastic washer or a wave washer, may also be disposed between the anchor plate
11 and the vehicle. As the name suggests, the anti-rattle member serves to reduce noise
12 created by the vibration of the anchor plate against the sheet metal of the vehicle.

13 A persistent objective in the industry is to reduce manufacturing costs while
14 maintaining the same quality of performance. It would therefore be an advancement in
15 the art to provide an anchoring apparatus for securing safety restraint devices which
16 eliminated one or more elements while maintaining the same performance level. Such a
17 device is disclosed and claimed herein.

BRIEF SUMMARY OF THE INVENTION

20 The present invention is an anchoring apparatus which eliminates the need for an
21 anchor plate and an anti-rattle member. The anchoring device is configured for

1 attachment to an anchor bolt which is attached to a secured surface. The anchoring
2 apparatus includes a flexible connector member which may be embodied as a strip of
3 fabric material. An end of the connector member is disposed to form a loop and then
4 attaches to the remaining body of the connector member. The loop formed defines an
5 anchor aperture which may receive and retain the anchor bolt.

6 The loop may further be configured with one or more twists to consolidate the
7 connector member around the aperture. This allows the aperture to better engage the
8 anchor bolt. The attachment of the end to the connector member ensures retention of the
9 twists in the loop. The attachment of the end is achieved by use of a fastener which may
10 be embodied as stitches, adhesives, rivets, clips, staples and so forth.

11 In an alternative embodiment, the end may form a knot, a loop, and then attach to
12 the remainder of the connector member. The knot consolidates material in the connector
13 member around the aperture and further defines the aperture. In this embodiment, the
14 loop may further be configured with one or more twists to further consolidate material
15 around the aperture.

16 The anchoring apparatus is simple to manufacture, effective in performance, and
17 eliminates parts. The anchoring apparatus is therefore more compact and reduces
18 manufacturing and component costs. The invention reduces the number of components,
19 the number of drawings, and the amount of weight.

1 These and other features, and advantages of the present invention will become
2 more fully apparent from the following description and appended claims, or may be
3 learned by the practice of the invention as set forth hereinafter.

4
5 **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING**

6 In order that the manner in which the advantages and features of the invention
7 are obtained, a more particular description of the invention summarized above will be
8 rendered by reference to the appended drawings. Understanding that these drawings
9 only provide selected embodiments of the invention and are not therefore to be
10 considered limiting of the scope, the invention will be described and explained with
11 additional specificity and detail through the use of the accompanying drawings in
12 which:

13 Figure 1 is a plan view of a conventional anchoring apparatus;

14 Figure 2 is a plan view of one embodiment of the anchoring apparatus of the
15 present invention;

16 Figure 3 is a plan view of an alternative embodiment of the anchoring apparatus
17 of the present invention;

18 Figure 4A is a perspective view of one embodiment of the anchoring apparatus of
19 the present invention secured to a fixed member;

20 Figure 4B is a perspective view of an alternative embodiment of an anchoring
21 apparatus of the present invention secured to a fixed member; and

1 Figure 4C is a perspective view of an alternative embodiment of an anchoring
2 apparatus of the present invention secured to a fixed member.

3 4 DETAILED DESCRIPTION OF THE INVENTION

5 A preferred embodiment of the invention is now described with reference to the
6 Figures 1-4, where like reference numbers indicate identical or functionally similar
7 elements. The components of the present invention, as generally described and illustrated
8 in the Figures, may be implemented in a wide variety of configurations. Thus, the
9 following more detailed description of the embodiments of the system and method of the
10 present invention, as represented in the Figures, is not intended to limit the scope of the
11 invention, as claimed, but is merely representative of presently preferred embodiments of
12 the invention.

13 Referring to Figure 1, a conventional anchoring apparatus 10 is shown. The
14 anchoring apparatus 10 includes a flexible connecting member 12 which is frequently
15 referred to in the industry as a tether. The connecting member 12 may be formed of
16 various fabric materials such as nylon, polyester, dacron or kevlar. The anchoring
17 apparatus 10 further includes an anchor plate 14 which may be formed of metal or plastic.
18 The anchor plate 14 has a receiving aperture 16 for receiving an end of the connecting
19 member 12. After being fed through the receiving aperture 16, the end of the connecting
20 member 12 is attached to the remaining body of the connecting member 12. Attachment
21

1 of the end to the connecting member 12 may be achieved by a fastener 18 which may be
2 embodied as stitches, rivets, staples, adhesives, clips and so forth.

3 The anchor plate 14 further includes an anchor aperture 20 which is configured to
4 receive an anchor bolt (not shown). The anchor bolt is threadably secured to a surface of
5 a vehicle to thereby anchor the connecting member 12. Because the anchor plate 14 may
6 vibrate against the anchor bolt or surface, one or more washers may be inserted to reduce
7 the annoying noise.

8 The opposing end of the connecting member 12 may be attached to a safety
9 restraint device such as a member of a seat belt harness or an air bag system. Securement
10 of a safety restraint device is necessary to ensure the proper function of the device. For
11 example, during deployment of an air bag, the air bag must remain secured in a certain
12 location to ensure that it provides restraint to the occupant. The air bag must further be
13 allowed to expand and move to a predetermined. The flexible connecting member 12
14 allows for movement of a safety restraint device to a certain location before limiting
15 further movement.

16 Referring to Figure 2, one embodiment of the anchoring apparatus 22 of the
17 present invention is shown. The anchoring apparatus 22 includes a connecting member
18 12 which is flexible and may be formed of a fabric material such as that disclosed in the
19 anchoring apparatus 10 of Figure 1. The connecting member 12 may be configured as a
20 rectangular elongated strip as shown or as a cord or rope. The connecting member 12 has
21 an end 24 which is secured to the body of the connecting member 12 to thereby create a

1 loop 26 and an anchor aperture 28. The securement of the end 24 is achieved by a
2 fastener 18 which may be embodied as stitches, rivets, staples, adhesives, clips and so
3 forth. In the embodiment shown in Figure 2, the end 24 is attached through stitching 18
4 which is disposed in a specific pattern as is known in the art.

5 In creating the loop 26, the connecting member 12 is rotated into one or more
6 twists 30. The number of twists 30 may vary depending on the desired consolidation of
7 the loop 26, size of the aperture 28, and material density of the connecting member 12.
8 The end 24 is secured to prevent the twists 28 from unwinding to thereby ensure the
9 placement of the twists 28. The twists 28 assist in defining the anchor aperture 28 by
10 consolidating the connecting member 12 around the aperture 28. In this manner, the
11 twists 30 strengthen the loop 26 and better allow the anchor aperture 28 to engage an
12 anchor bolt.

13 Referring to Figures 3A and 3B, an alternative embodiment of the anchor
14 apparatus 22 of the present invention is shown. As in the embodiment of Figure 2, the
15 anchor apparatus 22 includes a connecting member 12 formed of a flexible fabric
16 material. The connecting member 12 has an end 24 which is secured to the body of the
17 connecting member 12 to thereby create a loop 26 and an anchor aperture 28. The end 24
18 is secured by a fastener 18 such as previously disclosed in the embodiment of Figure 2.
19 The connecting member 12 is further configured to form a knot 32 as the end 24 forms
20 the loop 26. The knot 32 may be embodied as a simple slip knot as shown. The knot 32
21 is fixed as the end 24 is secured to the connecting member 12. One of skill in the art will

1 appreciate that various knots may be used and are included within the scope of the
2 invention.

3 Similar to the twists 30 in the embodiment of Figure 2, the knot 32 assists in
4 defining the anchor aperture 28. The knot 32 further strengthens the loop 26 by
5 consolidating material of the connecting member 12 around the aperture 28. This
6 provides superior retention and engagement of the aperture 28 to an anchor bolt. The
7 loop 26 may further be configured with one or more twists 30. The addition of the twists
8 30 further consolidate the connecting member 12 around the aperture 28 and define the
9 aperture 28.

10 Referring to Figures 4A to 4C, the anchor apparatus 22 is shown in engagement
11 with an anchor bolt 34. The anchor bolt 34 may be embodied in various forms and is
12 threaded or riveted into an anchoring surface 36. The anchoring surface 36 may be
13 embodied as sheet metal in the body of the vehicle or seat. In Figure 4A, the anchor bolt
14 34 is embodied as having a circular, flat head 38. The head 38 is configured to have a
15 diameter greater than the aperture 28 to thereby secure the anchoring apparatus 22. In
16 Figure 4B, the anchor bolt 34 is embodied with an O-ring 40 to which the anchoring
17 apparatus 22 is secured. In Figure 4C, the anchor bolt 34 is configured with T-shaped
18 head 42 to which the anchoring apparatus 22 is attached. Although some embodiments
19 for the anchor bolt 34 have been shown, one of skill in the art will appreciate that the
20 anchoring apparatus 22 is suitable for use with anchoring bolts of various embodiments.
21

1 The opposing end (not shown) of the connecting member 12 is secured to a safety
2 restraint device such as a component of a seat belt harness or an air bag system.

3 Securement may be achieved through the use of fasteners such as those disclosed in
4 reference to fastener 18. Thus secured, the anchoring apparatus 22 provides limited and
5 flexible movement of a safety restraint device. This ensures that the safety restraint
6 device will be confined to a particular location as intended. The safety restraint device is
7 further prevented from free movement during an accident situation which may cause
8 injury to an occupant.

9 The anchoring apparatus 22 of the present invention is advantageous in that it
10 eliminates the need for an anchor plate 14 and an anti-rattle device. The anchoring
11 apparatus 22 is therefore more compact and reduces manufacturing and component costs.
12 The invention reduces the number of components, the number of drawings, and the
13 amount of weight. As a result, the invention improves mistake-proofing on the assembly
14 line in manufacturing. The anchoring apparatus 12 further performs at an equivalent
15 level to conventional apparatuses.

16 The present invention may be embodied in other specific forms without departing
17 from its scope or essential characteristics. The described embodiments are to be
18 considered in all respects only as illustrative and not restrictive. The scope of the
19 invention is, therefore, indicated by the appended claims rather than by the foregoing
20 description. All changes which come within the meaning and range of equivalency of the
21 claims are to be embraced within their scope.

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What is claimed and desired to be secured by Letters Patent is: